WHAT IS CLAIMED IS:

1. A fabrication method of a semiconductor integrated circuit device, comprising the steps of:

(a) depositing a silicon nitride insulating film on a semiconductor substrate;

(b) depositing a silicon oxide insulating film on said silicon nitride insulating film; and

(c) subjecting said semiconductor substrate to a plasma etching treatment using an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process said silicon oxide insulating film,

wherein a residence time of the etching gas within an etching chamber is set at 50 to 700 ms.

2. A method according to Claim 1, wherein a pressure within the etching chamber during the course of the plasma etching treatment ranges from 0.7 to 7 Pa.

3. A method according to Claim 1, wherein a total flow rate of the etching gas passed into the etching chamber ranges from 200 to 1000 cm^3/minute.

4. A method according to Claim 1, wherein a total flow rate of the etching gas passed into the etching chamber is at 700 cm^3/minute or over.

5. A method according to Claim 1, wherein a pressure within the etching chamber during the plasma etching ranges from 1.3 to 4 Pa, and the total flow rate of the etching gas passing into the etching chamber is at 700 cm^3/minute or over.

6. A method according to Claim 1, wherein a flow rate of said dilution gas is larger than the flow rates of said fluorocarbon gas and oxygen.

7. A method according to Claim 1, wherein a temperature of said semiconductor substrate being plasma etched ranges from 60 to 140°C.

8. A method according to Claim 1, wherein a temperature of said semiconductor substrate being plasma etched ranges from 100 to 130°C.

9. A method according to Claim 1, wherein a plasma density during the plasma etching ranges from 1×10^{10} to $1 \times 10^{13}/cm^3$.

10. A method according to Claim 1, wherein a plasma density during the plasma etching ranges from 1×10^{10} to $1 \times 10^{12}/cm^3$.

11. A method according to Claim 1, wherein said fluorocarbon gas is made of C_5F_8, and said dilution gas is made of argon.

12. A method according to Claim 11, wherein a flow rate of said argon gas ranges from 200 to 1000 cm^3/minute.

13. A method according to Claim 11, wherein the flow rate of said argon gas ranges from 400 to 800 cm^3/minute.

14. A method according to Claim 11, wherein a ratio in flow rate between the oxygen and C_5F_8 (oxygen/C_5F_8) ranges from 0.8 to 1.5.

15. A method according to Claim 11, wherein a ratio in flow rate between the oxygen and C_5F_8 (oxygen/C_5F_8) ranges from 1 to 1.2.

16. A method according to Claim 11, wherein a partial

pressure of C_5F_8 ranges from 0.02 to 0.2 Pa.

17. A method according to Claim 11, wherein a partial pressure of C_5F_8 ranges from 0.04 to 0.1 Pa.

18. A fabrication method of a semiconductor integrated circuit device, comprising the steps of:

(a) depositing a silicon nitride insulating film on a semiconductor substrate;

(b) depositing a silicon oxide insulating film on said silicon nitride insulating film; and

(c) subjecting said semiconductor substrate to a plasma etching treatment using an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process said silicon oxide insulating film,

wherein a residence time of the etching gas within an etching chamber is set at 50 to 350 ms.

19. A fabrication method of a semiconductor integrated circuit device, comprising the steps of:

(a) depositing a silicon nitride insulating film on a semiconductor substrate;

(b) depositing a silicon oxide insulating film on said silicon nitride insulating film; and

(c) subjecting said semiconductor substrate to a plasma etching treatment using an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process said silicon oxide insulating film,

wherein a residence time of said etching gas within an etching chamber is set at 100 to 200 ms.

20. A fabrication method of a semiconductor integrated circuit device, comprising the steps of:

(a) depositing a silicon nitride insulating film on a semiconductor substrate;

(b) depositing a silicon oxide insulating film on said silicon nitride insulating film; and

(c) subjecting said silicon oxide insulating film to a plasma etching treatment using an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process said silicon oxide insulating film,

wherein a pressure within an etching chamber during the plasma etching treatment ranges 0.7 to 7 Pa, and a total flow rate of the etching gas passed into said etching chamber is 700 cm^3/minute.

21. A fabrication method of a semiconductor integrated circuit device, comprising the steps of:

(a) depositing a silicon nitride insulating film on a semiconductor substrate;

(b) depositing a silicon oxide insulating film on the silicon nitride insulating film; and

(c) subjecting said silicon oxide insulating film to a plasma etching treatment to plasma etching with an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process the silicon oxide insulating film,

wherein a pressure within said etching chamber during the plasma etching ranges from 1.3 to 4 Pa, and a total flow rate of said etching gas passed into the etching chamber is at 700

cm^3/cm or over.

22. A fabrication method of a semiconductor integrated circuit device, comprising the steps of:

(a) depositing a silicon oxide insulating film on a semiconductor substrate;

(b) forming a hard mask on said silicon oxide insulating film; and

(c) subjecting said semiconductor substrate to a plasma etching treatment through the hard mask as an etching mask using an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process said silicon oxide insulating film,

wherein a residence time of the etching gas within an etching chamber is set at 50 to 700 ms.

23. A method according to Claim 22, wherein a pressure within the chamber during the plasma etching ranges from 0.7 to 7 Pa.

24. A method according to Claim 22, wherein a total flow rate of the etching gas passed into the etching chamber ranges from 200 to 1000 cm^3/minute.

25. A method according to Claim 22, wherein a total flow rate of the etching gas passed into the etching chamber is at 700 cm^3/minute or over.

26. A method according to Claim 22, wherein a pressure within the etching chamber during the plasma etching ranges from 1.3 to 4 Pa, and the total flow rate of the etching gas passing into the etching chamber is at 700 cm^3/minute or over.

27. A method according to Claim 22, wherein a flow rate

of said dilution gas is larger than the flow rates of said fluorocarbon gas and oxygen.

28. A method according to Claim 22, wherein a plasma density during the plasma etching ranges from 1 x 10^{10} to 1 x $10^{13}/cm^3$.

29. A method according to Claim 22, wherein a plasma density during the plasma etching ranges from 1 x 10^{10} to 1 x $10^{12}/cm^3$.

30. A method according to Claim 22, wherein said fluorocarbon gas is made of C_5F_8, and said dilution gas is made of argon.

31. A method according to Claim 30, wherein a flow rate of said argon gas ranges from 200 to 1000 cm^3/minute.

32. A method according to Claim 30, wherein a flow rate of said argon gas ranges from 400 to 800 cm^3/minute.

33. A method according to Claim 30, wherein a ratio in flow rate between the oxygen and C_5F_8 (oxygen/C_5F_8) ranges from 0.8 to 1.5.

34. A method according to Claim 30, wherein a ratio in flow rate between the oxygen and C_5F_8 (oxygen/C_5F_8) ranges from 1 to 1.2.

35. A method according to Claim 30, wherein a partial pressure of C_5F_8 ranges from 0.02 to 0.2 Pa.

36. A method according to Claim 30, wherein a partial pressure of C_5F_8 ranges from 0.04 to 0.1 Pa.

37. A fabrication method of a semiconductor integrated circuit device, comprising the steps of:

(a) depositing a silicon oxide insulating film on a semiconductor substrate;

(b) forming a hard mask on said silicon oxide film; and

(c) subjecting the semiconductor substrate to a plasma etching treatment through the hard mask as an etching mask using an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process said silicon oxide insulating film,

wherein a residence time of the etching gas within an etching chamber is set at 50 to 350 ms.

38. A fabrication method of a semiconductor integrated circuit device, comprising the steps of:

(a) depositing a silicon oxide insulating film on a semiconductor substrate;

(b) forming a hard mask on said silicon oxide film; and

(c) subjecting the semiconductor substrate to a plasma etching treatment through the hard mask as an etching mask using an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process said silicon oxide insulating film,

wherein a residence time of the etching gas within an etching chamber is set at 100 to 200 ms.

39. A fabrication method of a semiconductor integrated circuit device, comprising the steps of:

(a) depositing a silicon oxide insulating film on a semiconductor substrate;

(b) forming a hard mask on said silicon oxide film; and

(c) subjecting the semiconductor substrate to a plasma etching treatment through the hard mask as an etching mask using

an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process said silicon oxide insulating film,

wherein a pressure within the etching chamber during the plasma etching ranges from 0.7 to 7 Pa and a total flow rate of the etching gas passed into the etching chamber is 700 cm^3/minute or over.

40. A fabrication method of a semiconductor integrated circuit device, comprising the steps of:

(a) depositing a silicon oxide insulating film on a semiconductor substrate;

(b) forming a hard mask on said silicon oxide film; and

(c) subjecting the semiconductor substrate to a plasma etching treatment through the hard mask as an etching mask using an etching gas containing a fluorocarbon gas, oxygen and a dilution gas to process said silicon oxide insulating film,

wherein a pressure within the etching chamber during the plasma etching ranges from 1.3 to 4 Pa and a total flow rate of the etching gas passed into the etching chamber is 700 cm^3/minute or over.